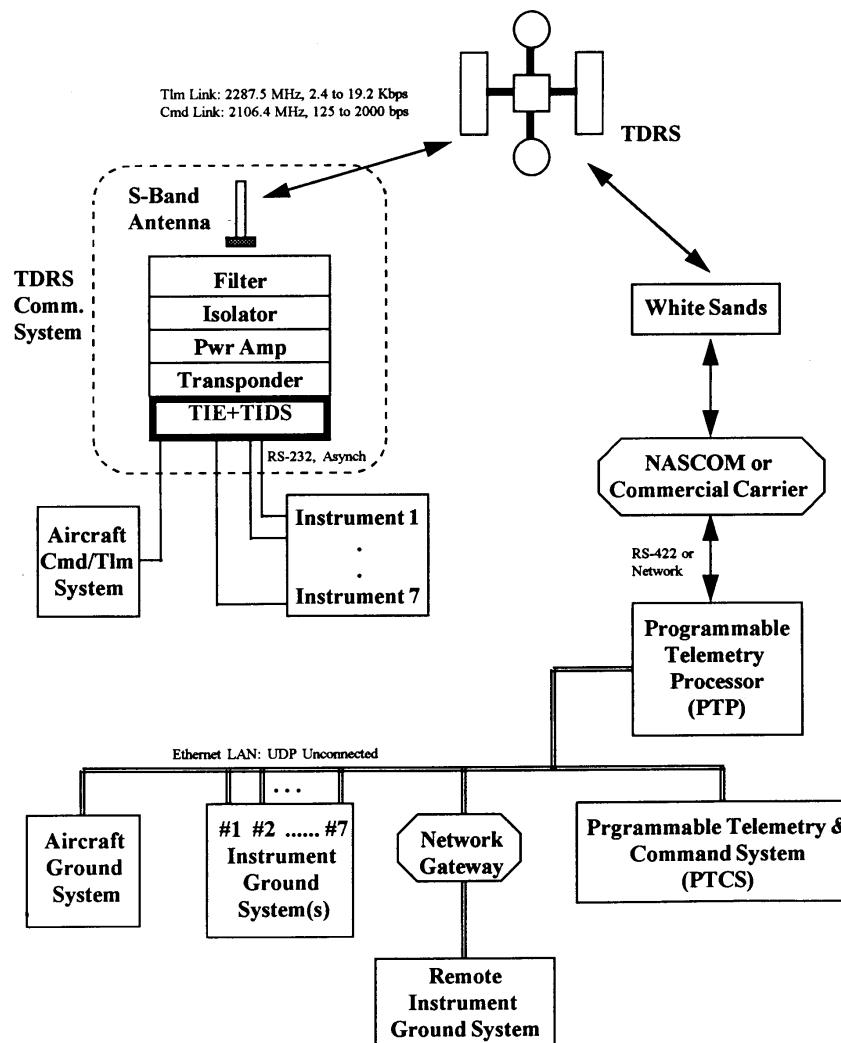


OPERATIONAL SYSTEM DATA FLOW



TDRSS Comm. System Component Mechanical Characteristics

Component	Power Usage (Watts)	Weight (lb.)	Size (in. x in. x in.)
Airborne Elements:			
TIE+TIDS	20	5	5 x 6 x 8
Transponder	50	15	13.5 x 7.5 x 6
Power Amplifier	130	10	12 x 12 x 6
RF Circuitry	passive	2	12 x 2 x 2 (RF Filter)
Antenna	passive	1	1 dia. x 6
Ground Elements:			
Programmable Telemetry Formatter (PTP)	100	20	mini tower PC
Programmable Telemetry & Command System (PTCS)	20	10	PC laptop

TIE+TIDS OVERVIEW



■ HARDWARE

- Supplier: PEP Modular Computers
- VME 3U form factor
- CPU: 68EC030 @ 40 MHz with 68302 comm. controller
- Serial I/O: Synchronous and Asynchronous
 - » Synchronous: 1 Tlm + 1 Cmd channel (RS-422)
 - » Asynchronous: 1 terminal + 8 FDX data ports (RS-232)
 - » Output Tlm rates up to ~ 150 Kbps (potential to ~ 500 Kbps)
- Ethernet Port
- Digital I/O
 - » 8 Outputs + 24 Inputs (all TTL)
 - » Used for control/monitor of transponder, control power relays

TIE+TIDS OVERVIEW



■ HARDWARE (Cont'd)

- Analog Inputs
 - » 8 inputs @ 12 bit resolution
 - » Used for temperature sensing of comm. system components
- Data Storage
 - » 40 MByte Flash memory card (PCMCIA) with card reader
 - » Used for flight software storage and raw Tlm storage
- Environmental Qualification to Extended Industrial Standards
 - » -40 to +85 deg. C
 - » Shock to 40 g, Vibration to 5 g @ 12 to 300 Hz

TIE+TIDS OVERVIEW



■ OPERATING SYSTEM

- OS-9 (version 3.0) from Microware
- Custom 68302 synchronous driver for tlm and cmd I/O

■ FLIGHT SOFTWARE

- Provide Cmd and Tlm Interface to Aircraft and Science Instruments:
 - » Multiplex all data streams into one Tlm channel
 - » Aircraft and Instrument ports are interchangeable with configurable baud rates.
- Provide monitoring and control of Transponder, Power Amp, Antenna, Internal TIE+TIDS.

TIE+TIDS OVERVIEW



■ FLIGHT SOFTWARE (Cont'd)

- CCSDS Tlm format
 - » Packet and transfer frame layers implemented
 - » All data formatted into packets.
 - » One virtual channel (VC0)
- Partial CCSDS Cmd format - Only Packet layer implemented
- CCSDS Cmd/Tlm used only for transport.
- Error Control
 - » Tlm: 16 bit CRC + 1/2 Conv. Encoding
 - » Cmd: 16 bit CRC
- Many software parameters are configurable via a setup file.
- Some SMEX FSW Heritage
- C language utilized